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MEASURES OF RADIAL VELOCITY OF κ CASSIOPEÆ, η PERSEI, 69 TAURI
AND ϵ CYGNI

BIBLIOTHEQUE DES
ETECOLE POLYTECHNIQUE
DE MONTREAL

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MEASURES OF RADIAL VELOCITY OF κ CASSIOPEÆ

(1900, $\alpha = 0^h 27^m \cdot 3$, $\delta = + 62^\circ 23'$, mag 4.24, type B)

This star was announced as a spectroscopic binary by Campbell, in *Lick Observatory Bulletin* No. 199, from 6 plates taken between 1902 and 1911, which showed a range in velocity of about 25 km.

Fifty-two plates were made here in 1913 and 1914 with the old single-prism spectrograph; those from plate 6184 to the end were made with the present arrangement having a dispersion of about 33 angstroms per millimetre at $H\gamma$. The hydrogen, helium and silicon lines are fair for a star of this type, but the measures upon them are not as accordant as could be desired. A table is given showing the data regarding these lines. The H and K lines of calcium are exceedingly good and the measures upon these two alone are about as reliable as upon all the rest put together. Their velocities are, however, more negative than those for the other lines. On the assumption of a constant velocity for the star, the weighted mean for the calcium lines on 51 plates, with a total weight of 107, is -16.77 km. per second, with a probable error for a plate of ± 4.45 km. per second. The corresponding velocity for the other lines on 50 plates, with a total weight of 115, is -3.02 km. per second. The extreme range in the case of the general lines is 59 km., while for the calcium lines it is only 34 km. A considerable amount of each may be regarded as fictitious owing to errors of measurement, but it would seem that this star is another example of the ever increasing class of spectroscopic binaries in which the displacements shown by the calcium absorption is much less than that for the other elements.

While there seems no doubt of the binary character of the star, the period has not yet been determined and the measures are published in case some one, who has not the equipment for observation, may wish to do some astronomical work by determining a period to fit the observations.

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LINES MEASURED IN α CASSIOPELE

λ	Element	n	Wt.	Residual	
				Numerical	Algebraic
4567.967.....	Si	17	7 $\frac{1}{2}$	9.9	-5.8
4552.762.....	Si	27	10 $\frac{1}{2}$	9.4	-5.8
4471.676.....	He	37	17	7.8	+0.7
4388.100.....	He	15	5 $\frac{1}{2}$	11.0	+5.0
4340.634.....	H	32	13 $\frac{3}{8}$	13.0	+6.5
4143.928.....	He	14	5 $\frac{1}{2}$	13.8	-1.1
4116.330.....		5	2 $\frac{1}{2}$	8.1	+1.0
4101.890.....	H	35	11 $\frac{1}{2}$	6.7	+2.8
4089.120.....		12	4 $\frac{1}{2}$	11.7	-8.3
4026.352.....	He	29	10 $\frac{1}{2}$	9.8	-2.1
3970.177.....	H	10	3 $\frac{1}{2}$	8.9	-6.4

MEASURES OF RADIAL VELOCITY OF κ CASSIOPELE

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SUMMARY OF VELOCITIES OF κ CASSIOPELE

Plate	Date	General Lines			<i>H</i> and <i>K</i>	
		Vel.	<i>n</i>	Wt.	Vel. + 13.8	Wt.
	1913					
5672	Sept. 15	+ 1.4	6	2 $\frac{1}{4}$	+ 2.8	2
5687	" 22	+ 0.4	4	2 $\frac{1}{2}$	+ 2.4	2 $\frac{1}{2}$
5706	" 26	- 6.2	5	3 $\frac{1}{2}$	+ 0.7	2
5713	" 29	- 4.5	3	1 $\frac{1}{4}$	+ 0.9	2
5730	Oct. 1	-14.6	3	1 $\frac{1}{2}$	+ 2.5	2 $\frac{1}{2}$
5738	" 3	$\pm$ 0.0	4	1	- 2.0	1
5744	" 4	+ 2.5	3	1 $\frac{1}{2}$	- 7.2	2 $\frac{1}{2}$
5840	Dec. 22	+ 3.1	4	2 $\frac{1}{4}$		
5859 a	" 31	+17.0	5	2 $\frac{1}{2}$	- 5.6	1 $\frac{1}{2}$
5859 b	" 31	+12.9	6	3 $\frac{1}{4}$	+ 1.0	1
	1914					
5876	Jan. 5				- 7.7	2
5881	" 12				- 7.0	1 $\frac{1}{2}$
6184	July 14	- 9.0	7	2 $\frac{1}{4}$	- 2.8	2
6199	" 17	- 1.7	6	2 $\frac{1}{2}$	+ 0.7	1 $\frac{1}{2}$
6217	" 21	$\pm$ 0.0	3	1 $\frac{3}{4}$	- 9.0	2
6271	Aug. 11	- 6.3	8	2 $\frac{1}{2}$	- 3.1	2
6277	" 14	- 4.6	6	1 $\frac{1}{2}$	-11.9	2
6288	" 19	-17.0	8	2 $\frac{1}{2}$	-18.4	2
6292	" 21	-40.8	4	1 $\frac{1}{2}$	-10.2	3
6309	" 25	-31.3	4	1 $\frac{1}{4}$	-23.8	2 $\frac{1}{4}$
6319	" 27	+ 4.6	5	2	- 2.6	2
6329	" 31	-25.5	6	2 $\frac{1}{2}$	- 9.4	$\frac{3}{4}$
6332	Sept. 2	- 0.3	6	2 $\frac{1}{2}$	- 1.3	1 $\frac{1}{2}$
6336	" 4	+ 2.2	6	1	- 2.0	2 $\frac{1}{4}$
6341	" 7	+ 2.8	5	1 $\frac{3}{4}$	+ 1.4	3
6343	" 8	-18.7	7	2 $\frac{1}{2}$	-11.4	2 $\frac{1}{2}$
6357	" 11	- 9.4	7	2 $\frac{1}{4}$	- 6.3	2 $\frac{1}{4}$
6361	" 12	-22.0	5	1 $\frac{3}{4}$	- 6.4	2 $\frac{1}{4}$
6364	" 13	+ 3.9	7	4	+ 1.1	1 $\frac{1}{2}$
6365	" 13	+ 9.8	7	3	+ 3.0	3
6370	" 14	-13.6	6	2 $\frac{1}{4}$	- 3.4	2
6377	" 15	+12.4	9	3 $\frac{1}{4}$	+ 3.8	5
6383	" 16	+11.6	6	2 $\frac{1}{4}$	- 6.8	2 $\frac{1}{4}$
6391	" 17	-11.7	4	1 $\frac{3}{4}$	- 4.2	2 $\frac{1}{2}$
6399	" 18	+13.0	8	3	+10.3	1
6406	" 19	- 5.1	10	5 $\frac{1}{4}$	- 4.2	2 $\frac{1}{2}$
6416	" 21	+10.8	6	1 $\frac{3}{4}$	-15.4	2 $\frac{1}{4}$
6427	" 25	- 6.0	5	2 $\frac{1}{2}$	- 7.0	2 $\frac{1}{4}$
6433	" 27	-21.7	5	1 $\frac{3}{4}$	- 2.8	2 $\frac{1}{4}$
6440	" 28	+ 1.0	5	2 $\frac{3}{4}$	- 1.0	2
6447	" 30	- 9.8	8	3 $\frac{1}{2}$	- 2.0	2 $\frac{1}{4}$
6455	Oct. 1	- 8.1	4	1	- 3.5	2
6464	" 2	- 3.6	6	1 $\frac{1}{2}$	+ 3.3	1 $\frac{1}{2}$
6480	" 4	- 3.8	4	1 $\frac{1}{4}$	+ 8.2	1 $\frac{1}{2}$
6499	" 13	- 5.6	4	1 $\frac{1}{4}$	- 0.3	1 $\frac{1}{2}$
6513	" 21	- 5.0	7	2 $\frac{1}{2}$	+ 7.3	1 $\frac{1}{2}$
6520	" 22	+ 2.6	6	3	+ 7.0	2 $\frac{1}{2}$
6529	" 23	+ 8.8	5	2 $\frac{1}{2}$	+ 9.9	2
6535	" 28	-23.0	6	2 $\frac{3}{4}$	- 9.9	2 $\frac{1}{4}$
6543	Nov. 2	-12.5	3	1	- 3.6	2
6553	" 4	-19.0	4	2	- 4.0	2 $\frac{1}{4}$
6555	" 14	+ 5.0	7	4 $\frac{1}{4}$	- 6.0	3

VELOCITIES OF THE H AND K LINES

Plate	Vel. H 3908-625	Wt.	Vel. K 3933-825	Wt.	Weighted Mean	Reduction to Sun	Radial Velocity
5672	-24.4	1	-23.7	1	-24.05	+13.10	-11.0
5687	-19.7	1½	-27.9	1	-23.00	+11.56	-11.4
5706	-20.0	1	-27.2	1	-23.60	+10.52	-13.1
5713	-24.8	1	-20.7	1	-22.75	+9.83	-12.9
5730	-13.7	1	-25.2	1½	-20.60	+9.35	-11.3
5738	-23.3	½	-25.7	½	-24.50	+8.73	-15.8
5744	-28.1	1	-30.5	1½	-29.54	+8.53	-21.0
5859a	-4.7	½	-2.6	1	-3.31	+16.14	-19.4
5859b	+5.0	½	+1.6	½	+3.30	-16.14	-12.8
5876	-2.8	1	-6.3	1	-4.55	-16.94	-21.5
5881	-2.7	½	-2.8	1	-2.77	-18.07	-20.8
6184	-32.5	1	-34.1	1	-33.30	+16.74	-16.6
6199	-32.0	½	-28.1	½	-30.05	+16.94	-13.1
6217	-41.6	1	-38.6	1	-40.10	+17.31	-22.8
6271	-42.5	½	-31.8	1½	-34.48	+17.57	-16.9
6277	-38.8	1	-47.3	1	-43.05	+17.35	-25.7
6288	-50.4	1	-47.9	1	-49.15	+16.99	-32.2
6292	-41.3	1½	-40.7	1½	-41.00	+16.99	-24.0
6309	-52.9	½	-54.8	1½	-54.17	+16.53	-37.6
6319	-35.8	1½	-27.6	½	-32.75	+16.40	-16.4
6329	-39.1	½	.....	.....	-39.10	+15.85	-23.2
6332	-26.1	½	-35.4	½	-30.75	+15.63	-15.1
6336	-23.1	½	-34.9	1½	-30.97	+15.22	-15.8
6341	-27.0	1½	-27.4	1½	-27.23	+14.79	-12.4
6343	-36.4	1½	-43.3	1½	-39.85	+14.06	-25.2
6357	-39.8	½	-31.8	1½	-34.47	+14.35	-20.1
6361	-40.9	½	-30.8	1½	-34.17	+13.98	-20.2
6364	-32.6	½	-23.4	1	-26.47	+13.73	-12.7
6365	-26.0	1½	-23.4	1½	-24.48	+13.72	-10.8
6370	-30.1	1	-31.3	1	-30.70	+13.46	-17.2
6377	-21.9	2½	-24.6	2½	-23.25	+13.28	-10.0
6383	-31.1	¾	-35.0	1½	-33.70	+13.10	-20.6
6391	-28.0	1	-32.9	1½	-30.92	+12.87	-18.0
6399	-13.6	¾	-19.7	½	-15.12	+12.62	-3.5
6406	-29.0	1	-31.2	1½	-30.32	+12.34	-18.0
6416	-37.8	¾	-42.7	1½	-41.07	+11.89	-29.2
6427	-29.4	¾	-32.9	1½	-31.73	+10.94	-20.8
6433	-28.2	¾	-26.4	1½	-27.00	+10.36	-16.6
6440	-17.4	½	-27.5	1½	-25.00	+10.23	-14.8
6447	-30.7	¾	-23.1	1½	-25.63	+9.79	-15.8
6455	-26.9	¾	-26.8	1½	-26.84	+9.58	-17.3
6464	-15.8	½	-21.9	1	-19.87	+9.36	-10.5
6480	-9.9	1	-20.2	½	-14.30	+8.69	-5.6
6499	-28.5	½	-15.9	1	-20.10	+6.03	-14.1
6513	-8.6	¾	-11.4	1	-10.20	+3.72	-6.5
6520	-4.5	1	-14.2	1½	-10.32	+3.52	-6.8
6529	-12.3	½	-5.3	1½	-7.05	+3.18	-3.9
6535	-25.3	¾	-25.0	1½	-25.10	+1.38	-23.7
6543	-15.7	¾	-18.2	1½	-17.30	-0.10	-17.4
6553	-17.0	1	-17.0	1½	-17.00	-0.84	-17.8
6555	-17.2	1½	-15.0	1½	-15.92	-3.93	-19.8

MEASURES OF κ CASSIOPEAE

λ	5672		5706		5713		5730		5738		5744		5840	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4567											- 8.3	$\frac{1}{2}$		
4552	-19.7	$\frac{1}{2}$	-42.0	$\frac{1}{2}$										
4471	16.7	$\frac{1}{2}$	17.3	1	-10.7	$\frac{1}{2}$	-18.1	$\frac{1}{2}$	-10.2	$\frac{1}{2}$	+ 4.6	$\frac{1}{2}$	+21.4	$\frac{1}{2}$
4388	0.0	$\frac{1}{2}$											20.9	$\frac{1}{2}$
4340	7.2	$\frac{1}{2}$	8.8	1			40.4	$\frac{1}{2}$	-18.1	$\frac{1}{2}$	-14.6	$\frac{1}{2}$	2.2	$\frac{3}{4}$
4143	3.0	$\frac{1}{2}$	21.6	$\frac{1}{2}$										
4101					12.3	$\frac{3}{4}$			-15.4	$\frac{1}{2}$			+32.3	$\frac{1}{2}$
4026	-19.2	$\frac{1}{2}$	- 1.2	$\frac{1}{2}$	-21.0	$\frac{1}{2}$	-13.5	$\frac{1}{2}$	+ 9.0	$\frac{1}{2}$				
Weighted mean	- 11.67		- 16.71		- 14.33		- 24.00		- 8.70		- 6.00		+ 17.24	
V_a	+ 13.41		+ 10.91		+ 10.15		+ 9.66		+ 9.11		+ 8.84		- 13.79	
V_d	- .03		- .11		- .04		- .03		- .10		- .03		- .11	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+ 1.4		- 6.2		- 4.5		- 14.6		$\pm$ 0.0		+ 2.5		+ 3.1	

MEASURES OF κ CASSIOPEAE—Continued

λ	5859 a		5859 b		6184		6199		6217		6271		6277	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4567			+21.9	$\frac{1}{2}$	-13.3	$\frac{1}{2}$			- 9.2	$\frac{3}{4}$				
4552			43.1	$\frac{1}{2}$	32.7	$\frac{1}{2}$	-11.9	$\frac{1}{2}$			- 5.9	$\frac{1}{2}$	-10.9	$\frac{1}{2}$
4471	+51.0	$\frac{1}{2}$	33.8	$\frac{1}{2}$	24.0	$\frac{1}{2}$	15.8	$\frac{3}{4}$	23.5	$\frac{1}{2}$	24.6	$\frac{1}{2}$	-42.6	$\frac{1}{2}$
4388			47.0	$\frac{1}{2}$	37.2	$\frac{1}{2}$					19.8	$\frac{1}{2}$		
4340	36.5	$\frac{1}{2}$					40.7	$\frac{1}{2}$			34.0	$\frac{1}{2}$	-40.2	$\frac{1}{2}$
4143	13.5	$\frac{1}{2}$	18.7	$\frac{1}{2}$									-25.4	$\frac{1}{2}$
4116					16.5	$\frac{3}{4}$								
4101	23.8	$\frac{1}{2}$			39.1	$\frac{1}{2}$	16.1	$\frac{1}{2}$	-23.2	$\frac{1}{2}$	25.8	$\frac{1}{2}$	-21.4	$\frac{1}{2}$
4089	+41.1	$\frac{1}{2}$					5.7	$\frac{1}{2}$			14.6	$\frac{1}{2}$	+ 9.2	$\frac{1}{2}$
4026			+ 7.3	$\frac{1}{2}$	-17.4	$\frac{1}{2}$	-13.9	$\frac{1}{2}$			34.0	$\frac{1}{2}$		
3970											-31.6	$\frac{1}{2}$		
Weighted mean	+ 33.18		+ 29.02		- 25.71		- 18.62		- 17.26		- 25.87		- 21.90	
V_a	- 15.76		- 15.76		+ 16.91		+ 17.18		+ 17.50		+ 17.81		+ 17.66	
V_d	- .10		- .10		+ .11		+ .04		+ .09		+ .04		- .03	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+ 17.0		+ 12.9		- 9.0		- 1.7		$\pm$ 0.0		- 6.3		- 4.6	

MEASURES OF κ CASSIOPEÆ—Continued

λ	6288		6292		6309		6319		6329		6332		6336	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4567			-56.4	$\frac{1}{2}$	-41.5	$\frac{1}{2}$			-32.6	$\frac{1}{2}$	-22.9	$\frac{1}{2}$		
4552	-30.5	$\frac{1}{4}$			43.8	$\frac{1}{4}$	-29.5	$\frac{1}{4}$	22.3	$\frac{1}{2}$			-11.8	$\frac{1}{4}$
4471	39.8	$\frac{1}{4}$							30.8	$\frac{1}{4}$	-36.8	$\frac{1}{4}$	-25.8	$\frac{1}{4}$
4388	19.4	$\frac{1}{4}$			58.9	$\frac{1}{4}$	-10.1	$\frac{1}{4}$	68.9	$\frac{1}{2}$	-3.0	$\frac{1}{4}$	-19.3	$\frac{1}{4}$
4340	49.2	$\frac{1}{4}$	74.5	$\frac{1}{4}$			-11.8	$\frac{1}{4}$						
4143	20.1	$\frac{1}{2}$					-30.4	$\frac{1}{4}$	49.6	$\frac{1}{2}$	-27.8	$\frac{1}{4}$	-4.0	$\frac{1}{2}$
4101	48.7	$\frac{1}{4}$									+4.4	$\frac{1}{2}$		
4089			44.2	$\frac{1}{4}$			+5.4	$\frac{1}{2}$			-9.0	$\frac{1}{2}$	-9.4	$\frac{1}{4}$
4026	40.8	$\frac{1}{2}$	-57.6	$\frac{1}{4}$	-53.3	$\frac{1}{4}$			-36.0	$\frac{1}{4}$			+3.5	$\frac{1}{2}$
3970	-30.3	$\frac{1}{4}$												
Weighted mean	-33.97		-57.82		-47.80		-11.80		-41.32		-15.90		-13.05	
V_a	+17.31		+17.17		+16.77		+16.57		+16.17		+15.81		+15.45	
V_d	-.04		+.19		+.04		+.11		-.04		+.10		+.05	
Curv.	-.28		-.28		-.28		-.28		-.28		-.28		-.28	
Radial Velocity	-17.0		-40.8		-31.3		+4.6		-25.5		-0.3		+2.2	

MEASURES OF κ CASSIOPEÆ—Continued

λ	6341		6343		6357		6361		6364		6365		6370	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4567					-19.8	$\frac{1}{4}$			+13.0	$\frac{1}{2}$	+33.1	$\frac{1}{4}$	-14.8	$\frac{1}{2}$
4552	-22.0	$\frac{1}{4}$	-48.0	$\frac{1}{4}$	15.4	$\frac{1}{4}$			-12.8	$\frac{1}{2}$	-3.9	$\frac{1}{4}$	18.8	$\frac{1}{4}$
4471	12.7	$\frac{1}{4}$	36.5	$\frac{1}{2}$	29.1	$\frac{1}{2}$	-36.3	$\frac{1}{4}$	-12.4	$\frac{1}{4}$	0.0	$\frac{1}{2}$	57.3	$\frac{1}{2}$
4388			14.8	$\frac{1}{4}$					-27.0	$\frac{1}{4}$			41.6	$\frac{1}{4}$
4340	1.6	$\frac{1}{2}$	28.2	$\frac{1}{2}$	29.5	$\frac{1}{4}$	32.8	$\frac{1}{2}$			-48.6	$\frac{1}{2}$		
4143					32.9	$\frac{1}{4}$					+30.0	$\frac{1}{2}$		
4116							42.8	$\frac{1}{2}$					34.6	$\frac{1}{4}$
4101	10.5	$\frac{1}{4}$	41.7	$\frac{1}{4}$			32.8	$\frac{1}{4}$	-22.5	$\frac{1}{4}$	+6.6	$\frac{1}{2}$		
4089			24.3	$\frac{1}{4}$					-7.2	$\frac{1}{4}$			-2.4	$\frac{1}{2}$
4026	-28.7	$\frac{1}{4}$	-41.2	$\frac{1}{4}$	20.9	$\frac{1}{4}$	-31.8	$\frac{1}{4}$	+2.2	$\frac{1}{2}$	-26.3	$\frac{1}{2}$		
3970					-18.4	$\frac{1}{2}$								
Weighted mean	-12.00		-33.38		-23.70		-36.00		-9.82		-3.95		-27.06	
V_a	+14.97		+14.81		+14.63		+14.10		+13.88		+13.88		+13.67	
V_d	+.10		+.13		.00		+.16		+.13		+.12		+.07	
Curv.	-.28		-.28		-.28		-.28		-.28		-.28		-.28	
Radial Velocity	+2.8		-18.7		-9.4		-22.0		+3.9		+9.8		-13.6	

MEASURES OF κ CASSIOPEAE—Continued

λ	6377		6383		6391		6399		6406		6416		6427	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4567	+15.3	$\frac{1}{4}$	-15.2	$\frac{1}{2}$										
4552	-3.2	$\frac{1}{2}$	+22.8	$\frac{1}{2}$	-11.9	$\frac{1}{2}$	+21.2	$\frac{1}{4}$	-7.0	1	+17.3	$\frac{1}{2}$		
4471	+8.2	$\frac{1}{2}$	-6.8	$\frac{1}{2}$	34.7	$\frac{1}{2}$	+12.2	$\frac{1}{2}$	25.6	$\frac{1}{2}$			-17.6	$\frac{1}{2}$
4388	-1.0	$\frac{1}{2}$	-15.1	$\frac{1}{2}$			-24.4	$\frac{1}{2}$	20.3	$\frac{1}{2}$	+6.0	$\frac{1}{2}$		
4340	-6.4	$\frac{1}{2}$	+0.4	$\frac{1}{2}$	12.8	$\frac{1}{2}$	-5.0	$\frac{1}{2}$	26.7	$\frac{1}{2}$	-1.3	$\frac{1}{2}$	-39.6	$\frac{1}{2}$
4143	-16.3	$\frac{1}{4}$							23.9	$\frac{1}{2}$	-13.0	$\frac{1}{2}$	+2.4	$\frac{1}{2}$
4116					-33.1	$\frac{1}{2}$			7.4	$\frac{1}{2}$				
4101	+2.8	$\frac{1}{4}$	+2.4	$\frac{1}{2}$			-1.6	$\frac{1}{2}$	19.9	$\frac{1}{2}$	+12.7	$\frac{1}{2}$	-21.9	$\frac{1}{2}$
4089	+1.1	$\frac{1}{2}$					-7.5	$\frac{1}{2}$	23.8	$\frac{1}{2}$				
4026	-5.3	$\frac{1}{2}$					-5.2	$\frac{1}{2}$	14.5	$\frac{1}{2}$	-15.1	$\frac{1}{2}$	-8.2	$\frac{1}{2}$
3970							+22.8	$\frac{1}{2}$	-6.7	$\frac{1}{2}$				
Weighted mean	-0.86		-1.45		-24.60		+0.37		-17.41		-1.14		-16.98	
V_a	+13.46		+13.25		+13.01		+12.79		+12.57		+12.13		+11.20	
V_d	+ .10		+ .13		+ .14		+ .11		+ .05		+ .04		+ .02	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+12.4		+11.6		-11.7		+13.0		-5.1		+10.8		-6.0	

MEASURES OF κ CASSIOPEAE—Continued

λ	6433		6440		6447		6455		6464		6480		6499	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4567			-19.3	$\frac{1}{2}$	-20.9	$\frac{1}{4}$								
4552	-50.0	$\frac{1}{4}$							-14.7	$\frac{1}{4}$			-4.5	$\frac{1}{4}$
4471	29.7	$\frac{1}{2}$	-12.4	$\frac{1}{2}$	-31.4	$\frac{1}{4}$	-9.7	$\frac{1}{4}$	-1.2	$\frac{1}{4}$	-20.3	$\frac{1}{2}$	6.2	$\frac{1}{2}$
4388					-2.6	$\frac{1}{4}$								
4340			+3.4	$\frac{1}{4}$	-33.1	$\frac{1}{2}$	28.1	$\frac{1}{4}$	-33.6	$\frac{1}{4}$	-3.7	$\frac{1}{2}$		
4143													26.1	$\frac{1}{4}$
4101	27.9	$\frac{1}{4}$	-6.6	$\frac{1}{2}$	-31.4	$\frac{1}{4}$	20.4	$\frac{1}{4}$	-41.1	$\frac{1}{4}$	-20.4	$\frac{1}{2}$	-15.1	$\frac{1}{4}$
4089	25.7	$\frac{1}{2}$			+10.5	$\frac{1}{4}$								
4026	-35.6	$\frac{1}{4}$	-17.6	$\frac{1}{2}$	-20.8	$\frac{1}{2}$	-12.6	$\frac{1}{4}$	+17.8	$\frac{1}{4}$	+1.5	$\frac{1}{4}$		
3970					-9.1	$\frac{1}{2}$			-4.8	$\frac{1}{4}$				
Weighted mean	-32.05		-9.20		-19.55		-17.70		-12.93		-12.46		-11.60	
V_a	+10.73		+10.50		+10.04		+9.81		+9.52		+8.94		+6.34	
V_d	- .09		+ .01		+ .03		+ .05		+ .12		+ .03		- .03	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	-21.7		+1.0		-9.8		-8.1		-3.6		-3.8		-5.6	

MEASURES OF κ CASSIOPEÆ—*Concluded*

λ	6513		6520		6529		6535		6543		6553		6555	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4567	+ 3.3	$\frac{1}{4}$			+ 7.1	$\frac{3}{4}$	-14.7	$\frac{1}{4}$					+ 1.2	$\frac{1}{2}$
4552	+ 1.6	$\frac{1}{4}$	+17.0	$\frac{1}{2}$			24.3	$\frac{1}{2}$	- 8.8	$\frac{1}{4}$	-13.3	$\frac{1}{2}$	+12.2	$\frac{1}{2}$
4471	-29.5	$\frac{1}{2}$	+ 4.6	$\frac{1}{2}$	+ 9.4	$\frac{1}{2}$	14.5	$\frac{1}{4}$	18.0	$\frac{1}{2}$	18.0	$\frac{3}{4}$	+23.6	$\frac{3}{4}$
4388													+ 6.2	$\frac{1}{2}$
4340	-16.8	$\frac{1}{2}$	-25.3	$\frac{1}{2}$	+11.4	$\frac{1}{2}$	39.4	$\frac{3}{4}$			32.3	$\frac{1}{4}$	-12.3	$\frac{3}{4}$
4143	+ 9.0	$\frac{1}{2}$	- 9.6	$\frac{1}{2}$										
4116	-11.3	$\frac{1}{4}$							- 4.7	$\frac{1}{4}$	-16.2	$\frac{1}{2}$	+ 6.2	$\frac{1}{2}$
4101	- 6.2	$\frac{1}{4}$	- 5.3	$\frac{1}{4}$	-15.5	$\frac{1}{4}$								
4089							1.0	$\frac{1}{4}$						
4026			+11.4	$\frac{1}{4}$	+ 4.2	$\frac{1}{2}$	-23.3	$\frac{1}{2}$						
Weighted mean	- 8.72		- 0.93		+ 5.60		- 24.36		- 12.40		- 18.16		+ 8.92	
V_s	+ 4.00		+ 3.68		+ 3.36		+ 1.78		+ 0.25		- 0.42		- 3.56	
V_d	.00		+ .12		+ .10		- .12		- .07		- .14		- .09	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 5.0		+ 2.6		+ 8.8		- 23.0		- 12.5		- 19.0		+ 5.0	

Dominion Observatory
Ottawa
April, 1919.

MEASURES OF RADIAL VELOCITY OF η PERSEI

BY W. E. HARPER, M.A.

(1900, $\alpha = 1^h 55^m \cdot 6$, $\delta = +54^\circ 01'$, mag 4.99, type B8)

This star was announced as a spectroscopic binary by Frost and Adams, in *Astrophysical Journal*, vol. XIX, page 352, from 4 measures in 1903 and 1904, giving a range from -24 to $+10$. Later, Lee published 5 measures of plates taken in 1907 and 1908 in the same journal, vol. XXXIX, page 44, without increasing the range. Adams and Kapteyn also give a velocity of $+12$ from 1 plate in the same journal, vol. XXVII, page 188.

Sixteen plates were secured here in 1910 and 1911, and then the star was dropped from our list as it was learned that the Allegheny observatory had it on their list and were working up its orbit.

The plates on the whole are not of as good quality as could be obtained, but the measures should be approximately correct. On some of the plates, the lines have the appearance of being doubled, there apparently being a red component to the hydrogen lines about $+105$ km. per sec. for plate 4561. Our measures indicate a slightly greater range than previously recorded.

OTTAWA MEASURES OF η PERSEI

Plate	Date, G.M.T.	Vel.	n	Wt.	Remarks
3720	1910, Oct. 7.816	-27	6	$3\frac{1}{4}$	
3727	" 10.777	-15	3	1	
4401	1911, June 29.836	-18	5	$2\frac{1}{2}$	
4491	Aug. 14.819	$+8$	3	$\frac{1}{4}$	
4513	" 30.871	$+5$	2	2	
4541	Sept. 12.768	-4	1	$\frac{1}{2}$	4481 gives $+59$
4551	" 13.835	$+19$	3	$1\frac{1}{4}$	
4561	" 17.778	$+4$	4	$3\frac{1}{2}$	4481 gives $+38$
4568	" 18.867	$+17$	3	$1\frac{1}{4}$	
4576	" 19.751	$+9$	3	$1\frac{1}{4}$	
4592	" 22.808	$+23$	3	$1\frac{1}{4}$	
4593	" 23.729	$+15$	4	$2\frac{1}{4}$	
4616	Oct. 9.786	-1	4	$2\frac{1}{2}$	
4643	" 13.696	-9	3	$\frac{1}{4}$	
4668	" 27.784	± 0	2	1	
4683	Nov. 3.628	-26	5	3	

MEASURES OF g PERSEI

λ	3720		3727		4401		4491		4513		4541		4551	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549-766	-41.0	$\frac{1}{2}$			-43.8	$\frac{1}{2}$							+15.1	$\frac{1}{2}$
4481-400	28.4	$\frac{3}{4}$	-10.6	$\frac{1}{4}$	24.6	$\frac{1}{2}$							-14.5	$\frac{1}{2}$
4340-634	42.0	$\frac{3}{4}$	23.1	$\frac{1}{4}$	31.8	$\frac{1}{2}$	-16.1	$\frac{1}{2}$	-18.2	1	-23.0	$\frac{1}{2}$	-2.6	$\frac{1}{4}$
4101-890	24.0	$\frac{1}{4}$			34.4	$\frac{1}{2}$	+6.6	$\frac{1}{4}$						
4026-352	54.9	$\frac{3}{4}$							-14.9	1				
3933-825	-35.2	$\frac{3}{4}$	-35.5	$\frac{1}{2}$	-42.0	$\frac{1}{2}$	-35.1	$\frac{1}{4}$						
Weighted mean	-39.17		-26.18		-35.32		-14.33		-16.55		-23.00		-0.24	
V_a	+12.81		+11.82		+17.08		+22.80		+21.68		+19.59		+19.38	
V_d	- .10		- .04		+ .19		+ .09		.00		+ .06		- .03	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	-26.7		-14.7		-18.3		+8.3		+4.9		-3.6		+18.8	

MEASURES OF g PERSEI—Continued

λ	4561		4568		4576		4592		4593		4616		4643	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549-766			+9.7	$\frac{1}{4}$									-24.9	$\frac{1}{2}$
4481-400			-2.5	$\frac{3}{4}$	-20.6	$\frac{1}{2}$	+10.1	$\frac{1}{2}$	-1.9	1	-8.3	1		
4471-676					-13.4	$\frac{1}{4}$					13.4	$\frac{1}{2}$	15.1	$\frac{1}{4}$
4340-634	-9.8	1	-2.6	$\frac{3}{4}$	+4.2	$\frac{1}{2}$	3.1	$\frac{1}{2}$	-5.8	$\frac{1}{4}$	18.5	$\frac{1}{2}$	-10.1	$\frac{1}{4}$
4101-890	22.5	1					+3.6	$\frac{1}{2}$	-1.0	$\frac{1}{2}$				
4026-352	-31.0	$\frac{3}{4}$							+2.8	$\frac{1}{2}$	-15.4	$\frac{1}{2}$		
3933-825	0.0	1												
Weighted mean	-14.80		-0.74		-9.20		+5.60		-1.44		-12.76		-20.00	
V_a	+18.52		+18.26		+18.05		+17.29		+17.06		+12.24		+10.90	
V_d	+ .03		- .05		+ .04		- .02		+ .09		- .04		+ .04	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+3.5		+17.2		+8.6		+22.6		+15.4		-0.8		-9.3	

MEASURES OF η PERSEI—*Concluded*

λ	4668		4683													
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4481.400	.....	.....	-41.2	1												
4340.634	- 7.3	$\frac{1}{2}$	17.6	$\frac{1}{2}$												
4101.890	.....	.....	10.3	$\frac{1}{2}$												
4026.352	.....	.....	23.4	$\frac{1}{2}$												
3933.825	- 3.0	$\frac{1}{2}$	-41.4	$\frac{1}{2}$												
Weighted																
mean	- 5.15		- 28.27													
V_0	+ 5.66		+ 2.95													
V_4	- .10		+ .04													
Curv.	- .28		- .28													
Radial																
Velocity	+ 0.1		- 25.6													

Dominion Observatory

Ottawa

April, 1919.

MEASURES OF RADIAL VELOCITY OF 69 TAURI

BY W. E. HARPER, M.A.

(1900, $\alpha = 4^h 20^m \cdot 3$, $\delta = +22^\circ 35'$, mag. 4.40, type A5)

This star was announced a spectroscopic binary by Frost, in the *Astrophysical Journal*, volume XXIX, page 238, from 5 plates taken in 1905, 1908 and 1909. He stated that the spectrum was a very difficult one to deal with, owing to the diffuse and complex character of the lines. In the hope of obtaining measures of the component spectra, the star was placed upon our list and some twenty odd plates secured in 1910, 1911, 1912 and 1913, of which 22 are given in the accompanying table. All but those in December, 1913, were made with the old single-prism spectrograph, whose dispersion at $H\gamma$ is 32.4 angstroms per millimetre; those in December, 1913, were made with camera Ia, whose dispersion is 54.5 angstroms per millimetre. To say that we have confirmed Frost's statement that it is a very difficult spectrum to deal with, would seem to sum up about all that we can say about the star. However, on plate 4646 the lines are much sharper than usual and numerous metallic lines, other than those appearing in the measures, are recorded whose velocities agree with those from the other lines. It would seem that the component spectra are superposed on this date, so that these fainter lines, which in general show no trace, are here of sufficient contrast to be measurable. Thus, it would appear that the velocity of the system must be in the neighbourhood of that given by this plate, namely, +50 km. per sec. The prevailing tendency to high positive velocities of the other plates bear this out. The star might possibly be worked up by using higher dispersion and fine-grained plates, attention being paid only to the metallic lines.

OTTAWA MEASURES OF 69 TAURI

Plate	Date	Vel.	Lines	Remarks
3659.....	1910, Sept. 15-902	+40	1	[plate underexposed
3669.....	" 16-836	- 6	2	
3834.....	Dec 8-604	+14	3	
3891.....	" 21-804	+ 3	1	
3904.....	" 30-578	+21	2	[very poor lines
3923.....	1911, Jan. 9-664	+76	3	
3937.....	" 16-628	+58	4	
4618.....	Oct. 9-903	+80	1	
4635.....	" 12-812	+77	1	[much sharper lines than usual.
4646.....	" 13-840	+50	9	
4708.....	Dec 3-812	+41	2	
4730.....	" 19-633	+38	2	
5198.....	1912, Sept. 16-846	+15	3	[poor plate [components +60 and -106.
5211.....	Oct. 1-753	+55	2	
5760.....	1913, Oct. 7-853	-27	2	
5789.....	Nov. 4-798	+27	3	
5796.....	" 5-795	+58	3	
5816.....	Dec. 8-737	+20	3	
5825.....	" 13-685	+59	3	
5847.....	" 22-740	+25	3	
8385.....	1917, Dec. 15-545	+22	1	
8398.....	" 28-627	+ 9	1	

MEASURES OF 69 TAURI

λ	3659	3669	3834	3891	3904	3923	3937
	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]
1861-527							+97.4 $\frac{1}{4}$
1481-400			+17.0 $\frac{1}{4}$				
4340-634	+11.5 $\frac{1}{4}$	-12.2 $\frac{1}{4}$	15.8 $\frac{1}{2}$	+14.7 $\frac{1}{4}$	+43.1 $\frac{1}{4}$	+80.0 $\frac{1}{4}$	81.0 $\frac{1}{4}$
4271-760						110.0 $\frac{1}{4}$	
4236-107		-27.1 $\frac{1}{4}$					
4101-890							51.1 $\frac{1}{4}$
4045-975					+30.0 $\frac{1}{4}$	+100.0 $\frac{1}{4}$	
3933-825			+22.6 $\frac{1}{4}$				+87.8 $\frac{1}{4}$
Weighted mean	+ 11.54	- 34.65	+ 19.40	+ 14.70	+ 36.55	+ 96.67	+ 81.02
V_d	+ 28.70	+ 28.28	- 4.89	- 11.59	- 15.68	- 20.01	- 22.62
V_d	- .00	- .12	+ .12	- .26	+ .09	- .09	- .11
Curv.	- .28	- .28	- .28	- .28	- .28	- .28	- .28
Radial Velocity	+ 40.0	- 6.5	+ 14.4	+ 2.6	+ 20.7	+ 76.3	+ 58.0

MEASURES OF 69 TAURI—Continued

λ	4618	4635	4646	4708	4730	5198	5211
	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]	Vel. [Wt.]
1861-527			+40.2 $\frac{1}{4}$	+38.7 $\frac{1}{4}$	+56.2 $\frac{1}{4}$	-23.5 $\frac{1}{4}$	+55.6 $\frac{1}{4}$
1481-400			40.6 $\frac{1}{2}$				
4340-634	+56.7 $\frac{1}{4}$	+55.0 $\frac{1}{4}$	28.1 $\frac{1}{4}$	+48.5 $\frac{1}{4}$	+41.1 $\frac{1}{4}$	-33.5 $\frac{1}{4}$	+ 4.2 $\frac{1}{4}$
4233-328			23.6 $\frac{1}{4}$				
4227-010			31.3 $\frac{1}{4}$				
4143-928			35.8 $\frac{1}{4}$				
4101-890			19.3 $\frac{1}{4}$			+20.1 $\frac{1}{4}$	
4045-975			20.7 $\frac{1}{4}$				
3933-825			+ 1.2 $\frac{1}{4}$				
Weighted mean	+ 56.70	+ 55.00	+ 28.80	+ 43.63	+ 48.65	- 12.63	+ 29.90
V_d	+ 22.94	+ 21.90	+ 21.62	- 2.24	- 10.39	+ 28.21	+ 25.05
V_d	+ .11	+ .04	- .04	- .21	+ .04	+ .10	+ .12
Curv.	- .28	- .28	- .28	- .28	- .28	- .28	- .28
Radial Velocity	+ 79.5	+ 76.7	+ 50.1	+ 40.9	+ 38.0	+ 15.4	+ 54.8

MEASURES OF 69 TAURI—*Concluded*

A	5760		5789		5796		5816		5825		5847		8385	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861-527	-75.3	1	+21.3	1	+61.0	1			+57.2	1	+28.6	1		
4481-400														
4340-634	-37.8	1	+20.0	1	14.6	1	+29.6	1			40.0	1	+31.2	1
4101-890							21.0	1	84.1	1				
3933-825			-2.1	1	+31.7	1	+25.1	1	+58.3	1	+41.3	1		
Weighted mean	-50.30		+14.80		+46.22		+25.20		+66.53		+37.63		+31.20	
V _a	-23.43		+12.30		+11.83		-5.06		-7.64		-12.16		-8.58	
V _d	.00		.06		.06		.10		.04		.18		.17	
Curv	-.28		.28		.28		.28		.28		.28		.28	
Radial Velocity	-27.2		+26.8		+55.7		+19.8		+58.6		+25.0		+22.5	

Dominion Observatory

Ottawa

April, 1919.

MEASURES OF RADIAL VELOCITY OF ϵ CYGNI

BY W. E. HARPER, M.A.

(1900, $\alpha = 20^h 42^m \cdot 2$, $\delta = + 33^\circ 36'$, mag. 2.64, type K)

This star was announced a spectroscopic binary by Curtis and Burns in *Lick Observatory Bulletin* 107. Their 7 plates show a range of about 7 km. Lord published 5 velocities in *Astrophysical Journal*, XXI, 319, showing a range of 4.4 km. with a mean value of -13.0 km. per sec. Campbell uses -10 km. per sec. for his statistical treatment of K type stars. Kilstner gives 6 measures in *Astrophysical Journal*, XXVII, 319, in which a range of 9.1 km. is shown.

Fifty plates were made here during the years 1907, 1908, 1909, 1914 and 1915, with the three-prism spectrograph, III L, which has a dispersion at $\lambda 4415$ of 10.1 angstroms per millimetre. The star has excellent lines for measurement, and as 15 or 20 were measured on each plate the results should be fairly reliable. The extreme range shown by our measures is from -4.5 to -14.6 km., but, apart from a few such plates, no great range is shown in the measures. The mean velocity, on the assumption of a constant velocity for the star, using the 50 plates with equal weights is -10.0 km. per sec. The residuals from this mean value follow the probability curve fairly closely and yield a probable error for a plate of ± 1.47 km. per sec., a value somewhat higher than might be expected from the good quality of the lines. If the 1914 and 1915 plates alone are used, —and they number 41 out of the 50—there is a reasonable appearance of the observations falling into a curve whose period is 19.664 days and range 5 km. Barring the plate of Aug. 4, 1914, (a memorable date) a considerable reduction in the probable error is effected. Five of the Lick observations are thereby satisfied but the first two are discordant.

While no doubt a small range exists, a satisfactory period has not yet been obtained. The measures are published so that if others should wish to attempt a period the data will be available to them.

OTTAWA MEASURES OF ϵ CYGNI

Plate	Date	Julian Date	Vel.	Plate	Date	Julian Date	Vel.
1163	1907, Nov. 29	2,417,909.48	- 8.2	6039	1914, Apr. 17	2,420,240.84	-12.0
1172	Dec. 4	914.54	9.1	6087	May 30	283.85	8.7
1186	" 12	922.52	10.3	6107	June 13	297.85	11.1
1210	1908, Jan. 3	944.45	8.5	6149	July 5	319.70	4.5
1556	May 25	2,418,087.85	9.0	6170	" 9	323.81	7.9
1618	June 20	113.77	13.7	6181	" 14	328.62	13.1
1795	Aug. 19	173.76	14.5	6194	" 16	330.84	13.7
2735	1909, Aug. 10	529.63	7.6	6208	" 19	333.79	9.6
2736	" 10	529.69	- 8.5	6213	" 21	335.60	- 8.8

OTTAWA MEASURES OF ϵ CYGNI—Continued

Plate	Date	Julian Date	Vel	Plate	Date	Julian Date	Vel
6225	1914, July 25	2,420,339.72	5.9	7065	1915, June 17	2,420,606.81	-12.7
6229	" 28	342.83	7.9	7070	" 20	669.79	10.1
6237	" 30	344.71	10.0	7086	July 1	680.84	8.1
6240	Aug 1	346	12.1	7094	" 9	688.80	11.7
6259	" 1	349.16	7.6	7095	" 10	689.68	7.7
6278	" 15	360.68	8.9	7097	" 12	691.81	10.9
6282	" 18	363.81	6.6	7100	" 13	692.80	10.3
6297	" 22	367.70	12.4	7106	" 17	696.68	11.5
6298	" 24	369.54	9.1	7107	" 19	698.59	10.1
6320	" 27	372.75	8.9	7114	" 20	699.84	11.3
6325	" 31	376.56	8.1	7117	" 22	701.84	14.6
6334	Sept 4	380.55	7.1	7120	" 23	702.86	11.8
6347	" 9	385.54	11.2	7121	" 26	705.58	11.6
6393	" 17	393.68	8.1	7131	" 29	708.58	10.9
6531	Oct 27	433.53	10.6	7136	Aug 1	711.67	9.7
7056	1915, June 8	657.83	-10.5	7142	" 8	718.66	-12.0

MEASURES OF ϵ CYGNI

λ	1172		1210		1556		1795		2735		6039		6087	
	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt
4586-191									5.1 1		-28.3 1		-28.8 1	1
4584-018					-27.6 1				5.2 1½		27.0 1		26.1 1	1
4581-618	+11.0 1		+4.6 1				-14.7 1		14.5 1				33.8 1	1
4580-107			8.4 1		33.0 1		11.3 1		13.0 1½		29.0 1		31.7 1	1
4565-726	10.9 1½								15.9 1½					
4556-202			6.7 1		33.4 1		10.9 1		10.0 1		25.4 1		25.5 1	1
4554-257	9.7 1								12.4 1		28.5 1		30.1 1	1
4552-594	11.9 1				32.5 1½		14.4 1½		10.0 1		29.2 1		26.4 1	1
4549-766	14.3 1½		3.0 1½		26.5 1½		17.7 1½		8.9 1		26.7 1		25.2 1	1
4535-965	8.2 1½		5.0 1											
4534-169			8.8 1						15.5 1		34.8 1		29.2 1	1
4531-202	7.5 1		3.7 1				14.5 1		10.7 1		28.3 1		26.9 1	1
4528-807	9.2 1		3.2 1		25.6 1		14.2 1½		5.6 1				23.3 1	1
4522-855	7.7 1		2.6 1		26.6 1						32.7 1			
4520-397											33.1 1			
4515-508									15.4 1		26.0 1			
4494-664									8.6 1					
4482-376	6.2 1				29.9 1		9.7 1				33.5 1		27.9 1	1
4476-214			3.0 1				9.4 1				23.0 1		25.2 1	1
4469-545	12.6 1		7.3 1						8.2 1					
4468-663			8.8 1		19.5 1						-24.2 1		21.4 1	1
4466-727	13.3 1		7.6 1				15.6 1		-8.3 1					
4454-962														
4415-354	6.0 1												-26.0 1	1
4395-286														
4352-908	+14.8 1		+7.0 1		-19.3 1									
Weighted mean	+10.31		+5.80		-27.73		-13.64		-10.12		-28.65		-27.17	
V_d	-18.86		-13.74		+18.93		0.35		+2.69		+16.69		+18.67	
V_d	-28		-27		-10		-19		+10		+22		+10	
Curv.	-28		-28		-28		-28		-28		-28		-28	
Radial Velocity	-9.1		-8.9		9.0		14.5		-7.6		-12.0		-8.7	

MEASURES OF ϵ CYGNI—Continued

λ	6107		6149		6170		6181		6194		6208		6213	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
1586.191	-22.0	1							-24.4	1	-16.7	1	-12.5	1
1584.018	27.6	1	-20.0	1										
1581.018	23.7	1	13.8	1	-16.6	1	-23.9	$\frac{1}{2}$	16.5	$\frac{1}{2}$	19.0	1	15.3	1
1580.407	31.8	1			16.9	1	20.7	$\frac{1}{2}$	27.4	1	21.8	1	20.1	1
1565.726	28.6	1	16.2	1	19.8	1	25.7	$\frac{1}{2}$	25.7	1	19.2	1	22.6	1
1563.939									31.3	$\frac{1}{2}$				
1556.202									22.7	$\frac{1}{2}$	20.3	1		
1554.257	26.6	1	14.2	1	20.2	1	18.0	$\frac{1}{2}$	23.0	1	16.4	1	17.8	1
1552.594	32.4	1	12.6	1	22.2	1	26.4	$\frac{1}{2}$	24.0	$\frac{1}{2}$	17.9	1	13.9	1
1549.766	30.1	1	19.7	1	19.2	1	27.9	$\frac{1}{2}$	21.7	1	18.6	1	15.5	1
1535.965	28.5	1	17.5	1	20.3	1	23.8	1	22.5	1	13.6	1	17.2	1
1534.169			19.5	1										
1531.202			22.3	1	23.8	1					23.0	1	22.7	1
1528.807	28.5	1	19.6	1	18.3	1			24.4	$\frac{1}{2}$	19.6	1	20.2	1
1522.855	30.0	1	18.2	1	17.0	1	21.7	$\frac{1}{2}$	29.3	$\frac{1}{2}$	18.3	1	14.9	1
1520.397					19.9	1								
1515.508	27.3	1			19.4	1								
1494.664			18.6	1	22.4	1			18.8	$\frac{1}{2}$	19.6	1	19.5	1
4476.214					23.1	1			25.7	$\frac{1}{2}$	21.1	1	19.3	1
4472.957	21.3	1	18.3	1			24.2	1	19.0	1	17.8	1	18.2	1
4469.545							21.1	$\frac{1}{2}$						
4466.727	24.6	1	15.0	1	-15.4	1					16.5	1	14.5	1
4464.772			13.9	1					17.5	$\frac{1}{2}$			15.5	1
4459.304													-19.7	1
4454.962									-25.8	$\frac{1}{2}$	-16.8	1		
4415.354	29.4	1					-26.6	$\frac{1}{2}$						
4395.286	-35.2	1	-19.6	1										
Weighted mean	- 28.03		- 17.44		- 19.63		- 23.81		- 23.53		- 18.60		- 17.61	
V_s	+ 17.19		+ 13.04		+ 12.05		+ 10.79		+ 10.21		+ 9.40		+ 8.89	
V_d	.00		+ .14		- .06		+ .22		- .13		- .08		+ .22	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 11.1		- 4.5		- 7.9		- 13.1		- 13.7		- 9.6		- 8.8	

MEASURES OF ϵ CYGNI - *Continued*

	0225	0229	0237	0240	0259	0259*	0278
	Vel. Wt.	Vel. Wt.	Vel. Wt.	Vel. Wt.	Vel. Wt.	Vel. Wt.	Vel. Wt.
1586-191	- 7.5 | 1	-14.1 | 1	-13.4 | 1	-14.4 | 1	- 7.0 | 1	- 6.6 | 1	- 9.1 | 1
1584-018	16.3 | 1	13.5 | 1			8.2 | 1	5.4 | 1	
1581-618	16.2 | 1	12.8 | 1	14.7 | 1	14.2 | 1	8.4 | 1	7.5 | 1	9.6 | 1
1580-407	11.5 | 1			17.9 | 1	18.5 | 1	15.3 | 1	
1565-726	17.5 | 1	16.9 | 1	17.5 | 1	17.2 | 1	14.8 | 1	15.1 | 1	12.0 | 1
1563-939			17.5 | 1				
1556-202				19.2 | 1	22.9 | 1	21.6 | 1	9.9 | 1
1554-257	10.7 | 1	11.8 | 1	21.7 | 1	17.2 | 1	10.2 | 1	7.8 | 1	12.5 | 1
1552-594	15.3 | 1	16.3 | 1	17.4 | 1	15.6 | 1	17.1 | 1	16.7 | 1	13.7 | 1
1549-766	10.6 | 1	10.6 | 1	17.6 | 1	19.3 | 1	12.6 | 1	11.4 | 1	8.0 | 1
1535-965	13.5 | 1	14.9 | 1	13.6 | 1	17.3 | 1	8.2 | 1	6.6 | 1	9.8 | 1
1531-202			22.0 | 1	21.1 | 1			5.2 | 1
1528-807	13.3 | 1	14.2 | 1	15.5 | 1	18.4 | 1	12.5 | 1	13.7 | 1	4.9 | 1
1525-285	15.0 | 1						
1522-855	13.7 | 1	14.5 | 1	14.6 | 1	14.8 | 1	9.0 | 1	9.4 | 1	8.0 | 1
1515-508	13.8 | 1		17.2 | 1	18.3 | 1	15.8 | 1	17.3 | 1	12.8 | 1
1501-448			19.5 | 1				
1494-664			12.3 | 1	20.2 | 1			14.6 | 1
1476-214	18.1 | 1	16.2 | 1	11.8 | 1		4.7 | 1	5.8 | 1	10.9 | 1
1472-957	7.0 | 1	-16.5 | 1	17.9 | 1	15.6 | 1	11.6 | 1	12.6 | 1	- 5.8 | 1
1469-545	14.4 | 1		9.5 | 1	14.9 | 1	9.2 | 1	12.0 | 1	
1468-663			19.1 | 1				
1466-727			-12.3 | 1				
1464-772				13.0 | 1	6.4 | 1	6.8 | 1	
1459-304	-12.5 | 1						
1454-062				-19.7 | 1	11.0 | 1	12.3 | 1	
1415-354					14.1 | 1	13.1 | 1	
4395-286					15.2 | 1	17.7 | 1	
4371-312					12.3 | 1	11.8 | 1	
4369-856					13.4 | 1	14.4 | 1	
4352-908					13.9 | 1	13.4 | 1	
4352-006					-10.4 | 1	-11.0 | 1	
Weighted mean	- 13.36	- 14.25	- 15.92	- 17.12	- 11.82	- 11.88	- 9.76
V_a	+ 7.70	+ 6.77	+ 6.15	+ 5.60	+ 4.64	+ 4.64	+ 1.15
V_d	+ .03	- .16	.00	+ .05	- .11	- .11	- .02
Curv.	- .28	- .28	- .28	- .66	- .28	- .28	- .28
Radial Velocity	- 5.9	- 7.9	- 10.0	- 12.1	- 7.6	- 7.6	- 8.9

*Check measurement

MEASURES OF ϵ CYGNI—Continued

λ	6282		6297		6298		6320		6325		6344		6347	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4586-191	- 2.0	$\frac{1}{2}$	- 4.6	1	- 3.3	1	- 1.0	1	+ 1.5	1	- 5.3	$\frac{1}{2}$	+ 3.0	1
4584-018	9.8	1			8.8	1							- 4.4	1
4581-618	7.3	1	9.4	1	4.7	1	2.7	1	- 2.8	$\frac{1}{2}$	- 2.9	1	- 2.6	1
4580-407	3.1	$\frac{1}{2}$	6.9	1	8.3	1	7.0	1	- 3.8	1	- 5.1	$\frac{1}{2}$	- 0.9	1
4565-726	6.6	1	14.0	1	8.0	1	6.3	1	- 5.2	$\frac{1}{2}$	- 3.9	1	- 8.3	1
4556-202			15.2	$\frac{1}{2}$	11.3	1					- 4.6	1		
4554-257	8.5	1	13.0	$\frac{1}{2}$	8.4	1	2.9	$\frac{1}{2}$	- 5.6	1			- 6.1	1
4552-594	5.4	1	17.5	$\frac{1}{2}$	7.1	1	6.6	1	- 7.2	1	- 2.6	1	- 6.1	1
4549-766	6.4	1	11.3	1	3.2	1	4.4	1	- 4.2	$\frac{1}{2}$	- 3.3	1	- 6.1	1
4535-965	4.6	1	7.8	1	6.4	1	5.4	1	- 4.4	1	- 1.0	$\frac{1}{2}$	- 6.8	1
4531-202							4.0	1	- 10.8	$\frac{1}{2}$				
4528-807	5.0	1	11.4	$\frac{1}{2}$	10.0	1	5.4	$\frac{1}{2}$	- 2.3	1	- 4.2	1	- 3.0	1
4522-855	3.0	1	5.6	1	8.8	1	2.9	$\frac{1}{2}$	- 4.9	$\frac{1}{2}$	- 6.1	1	- 5.5	1
4515-508	11.6	1	12.1	$\frac{1}{2}$	5.6	1			- 2.4	$\frac{1}{2}$				
4494-664	2.4	$\frac{1}{2}$	17.4	1	8.4	1	9.5	$\frac{1}{2}$	- 4.2	1	- 8.7	$\frac{1}{2}$	7.3	1
4482-376											+			
4476-214	10.1	1			10.4	1	14.8	$\frac{1}{2}$	- 4.1	1			- 6.1	1
4472-957	- 2.8	1	12.6	$\frac{1}{2}$	6.6	1	8.0	$\frac{1}{2}$	- 5.8	1	- 1.0		- 4.2	1
4469-545			8.3	$\frac{1}{2}$	9.2	1	0.9	$\frac{1}{2}$	+ 0.5	1			- 2.4	1
4466-727			6.6	$\frac{1}{2}$	- 1.9	1	3.4	$\frac{1}{2}$	- 4.3	1	+ 0.6	1	0.0	1
4464-772			- 5.8	$\frac{1}{2}$							+ 3.6	1		
4459-304											- 0.3	1		
4454-962							7.7	$\frac{1}{2}$						
4427-420									- 6.5	$\frac{1}{2}$				
4415-354							- 12.5	$\frac{1}{2}$	- 5.8	1				
Weighted mean	- 6.18		- 10.88		- 7.25		- 5.67		- 4.29		- 1.68		- 4.18	
V_0	+ 0.13		- 1.14		- 1.73		- 2.77		- 4.00		- 5.26		- 6.83	
V_1	- .22		- .11		+ .16		- .16		+ .12		+ .12		+ .11	
Curv.	- .28		+ .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 6.6		- 12.4		- 9.1		- 8.9		- 8.4		- 7.1		- 11.2	

MEASURES OF ϵ CYGNI—Continued

λ	6393		6534		7056		7056°		7065		7070		7086	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4586-191			+12.6	$\frac{1}{2}$	-25.8	1	-23.0	1	-23.2	1	-16.7	1	-16.6	$\frac{1}{2}$
4584-018			7.3	1	33.9	$\frac{1}{2}$	33.0	1	30.4	1				
4581-618			10.1	$\frac{1}{2}$	29.7	1	28.6	1	28.6	1	21.9	1	23.8	$\frac{1}{2}$
4580-407	+ 2.6	1	7.4	$\frac{1}{2}$					29.7	1	25.6	1	26.8	$\frac{1}{2}$
4572-156					34.0	1			30.2	1				
4565-726	+ 8.4	1	9.3	$\frac{1}{2}$	31.6	1	30.8	1						
4554-257			9.0	$\frac{1}{2}$	30.6	$\frac{1}{2}$	29.0	1	32.6	1	24.5	1	18.9	1
4552-594	+ 3.6	$\frac{1}{2}$	9.0	$\frac{1}{2}$	28.6	1	26.3	1	30.4	1			28.3	$\frac{1}{2}$
4549-766	+ 0.3	1	5.7	1	28.5	1	27.3	1	28.0	1	25.5	1	22.7	1
4535-965	+ 3.7	1	9.1	1	25.6	1	24.9	1	27.8	1	24.7	1	15.1	$\frac{1}{2}$
4534-169					24.5	1								
4531-202			2.4	1					30.9	1	27.3	1		
4528-807	- 1.2	1	6.4	1	28.9	1	26.2	1	30.6	1	29.7	1	27.2	1
4525-285									33.7	1	34.9	1		
4522-855			10.5	$\frac{1}{2}$	30.7	1	30.7	1	30.0	1	28.0	1	19.7	1
4515-508			5.1	$\frac{1}{2}$										
4494-664	- 8.1	$\frac{1}{2}$	6.2	1			24.6	$\frac{1}{2}$	28.3	1	30.7	1	21.8	$\frac{1}{2}$
4482-376									26.4	1				
4476-214	- 1.1	1	1.3	1	22.6	$\frac{1}{2}$			28.7	1	27.6	1	21.8	1
4472-957			5.9	1	26.8	1	22.8	1	24.6	1	21.3	1		
4469-545					26.0	1			24.9	1				
4468-663					29.4	1								
4466-727			10.0	$\frac{1}{2}$	31.1	$\frac{1}{2}$	26.6	$\frac{1}{2}$					-20.3	1
4464-772	+ 8.2	1	10.4	$\frac{1}{2}$										
4459-304			+ 7.4	$\frac{1}{2}$	31.5	1	28.5	1						
4454-962											26.3	1		
4427-420							25.3	1			26.4	1		
4415-354	- 0.9	1			-28.6	1	-29.8	1	-32.3	1	-25.6	1		
4404-927	- 1.9	$\frac{1}{2}$												
4395-286	- 0.8	1												
4352-908	+ 9.2	$\frac{1}{2}$												
4352-006	- 0.2	1												
Weighted mean	+ 1.62		+ 7.40		- 28.81		- 27.45		- 29.02		- 26.04		- 21.69	
V_s	- 9.28		- 17.62		+ 17.86		+ 17.86		+ 16.57		+ 16.14		+ 13.97	
V_d	- .16		- .09		+ .04		+ .04		+ .03		+ .07		- .07	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 8.1		- 10.6		- 11.2		- 9.8		- 12.7		- 10.1		- 8.1	

*Check measurement

MEASURES OF ϵ CYGNI—Continued

λ	7094		7095		7097		7100		7106		7107		7114	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4586-191	-19.0	1	-17.9	$\frac{1}{2}$	-19.4	1	-17.6	1	-15.2	1	-12.5	1	-17.1	1
4584-018			22.7	$\frac{1}{2}$	25.8	1					23.9	1	23.0	1
4581-618	27.4	1	15.4	$\frac{1}{2}$	21.0	1	22.3	1	20.9	1	18.5	1	20.0	1
4580-407			18.9	$\frac{1}{2}$	26.2	1	21.3	1	30.6	$\frac{1}{2}$			26.6	1
4565-726									21.8	1	22.0	1	22.4	1
4556-202					25.8	1							21.5	1
4554-257			22.0	$\frac{1}{2}$	17.4	1	23.8	1	27.1	1	17.1	1	19.2	1
4552-534	25.5	1	20.2	$\frac{1}{2}$	21.1	1	21.8	1	21.3	1	20.9	1	17.1	1
4549-766	22.4	1	11.2	$\frac{1}{2}$	21.3	1	18.5	1	22.4	1	16.8	1	20.0	1
4535-965	23.2	1	23.4	$\frac{1}{2}$	17.7	1	18.7	1	20.5	1	19.6	1	19.0	1
4531-202					23.8	1								
4528-807	23.4	$\frac{1}{2}$	-23.4	$\frac{1}{2}$	22.8	1	22.3	1	22.3	1	18.6	1	21.4	1
4522-855	22.8	1			23.0	1	19.6	1	20.8	1	24.7	1	17.7	1
4494-664	21.4	1			20.2	1	21.4	1			21.1	1	17.5	1
4476-214	21.5	1			18.7	1	26.3	1	20.5	1	21.0	1		
4472-957	20.4	1			19.1	1	19.4	1	17.7	1			21.1	1
4469-545					23.3	1	20.4	1					17.7	1
4466-727	17.8	$\frac{1}{2}$			18.8	1	16.8	1	16.3	1	16.0	1	17.4	1
4464-772									15.9	1	17.4	1	18.8	1
4459-304	20.9	1					20.9	1	25.4	$\frac{1}{2}$			21.0	1
4427-420	24.2	1					22.0	1	28.0	1	21.1	1	22.6	1
4415-354	29.0	1			-30.7	1	-24.6	1	23.3	1	-22.5	1	-19.8	1
4395-286	27.6	1												
4352-908	23.2	1							-21.6	1				
4352-006	-27.1	1												
Weighted mean	-23.51		-19.46		-22.06		-21.04		-21.38		-19.61		-20.09	
V_a	+12.11		+11.88		+11.35		+11.09		+10.07		+9.52		+9.26	
V_d	- .05		+ .14		+ .07		- .06		+ .12		+ .23		- .15	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 11.7		- 7.7		- 10.9		- 10.3		- 11.5		- 10.1		- 11.3	

MEASURES OF ϵ CYGNI—*Concluded*

λ	7117		7120		7121		7131		7136		7142			
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4586-191	-21.0	1	-19.6	1	-15.2	1	-10.8	1	-10.1	1	-10.2	1	.....	.....
4584-018	.....	.....	.....	.....	21.0	1	21.8	1	14.2	1	.....	.....	.....	.....
4581-618	24.5	1	17.4	1	16.9	1	14.1	1	11.9	1	16.2	1	.....	.....
4580-407	23.9	1	26.1	1	21.6	1	21.9	1	20.7	1	18.3	1	.....	.....
4565-726	23.0	1	24.6	1	20.6	1	18.7	1	16.8	1	18.2	1	.....	.....
4556-202	29.7	1	24.0	1	.....	.....	12.7	1	15.2	1	.....	.....	.....	.....
4554-257	24.8	1	15.3	1	16.0	1	19.4	1	13.3	1	.....	.....	.....	.....
4552-594	22.6	1	18.6	1	17.8	1	18.2	1	15.8	1	14.0	1	.....	.....
4549-766	23.4	1	15.2	1	19.2	1	16.3	1	13.9	1	14.7	1	.....	.....
4535-965	24.1	1	18.0	1	19.8	1	17.4	1	13.8	1	16.0	1	.....	.....
4531-202	28.8	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4528-807	22.9	1	16.9	1	20.1	1	16.9	1	16.3	1	18.5	1	.....	.....
4525-285	.....	.....	.....	.....	.....	.....	22.7	1	.....	.....	.....	.....	.....	.....
4522-855	22.9	1	-22.0	1	23.7	1	16.4	1	17.5	1	15.1	1	.....	.....
4494-664	18.8	1	.....	.....	16.8	1	19.1	1	14.6	1	21.1	1	.....	.....
4476-214	25.2	1	.....	.....	18.0	1	22.2	1	16.8	1	14.4	1	.....	.....
4472-957	19.3	1	.....	.....	17.5	1	15.2	1	13.3	1	11.8	1	.....	.....
4469-545	.....	.....	.....	.....	20.0	1	.....	.....	13.6	1	.....	.....	.....	.....
4468-663	.....	.....	.....	.....	17.3	1	.....	.....	.....	.....	.....	.....	.....	.....
4466-727	16.6	1	.....	.....	15.0	1	11.2	1	5.9	1	6.7	1	.....	.....
4459-304	17.4	1	.....	.....	17.8	1	.....	.....	.....	.....	12.3	1	.....	.....
4427-420	26.2	1	.....	.....	21.8	1	14.7	1	14.6	1	18.7	1	.....	.....
4415-354	-20.7	1	.....	.....	19.0	1	-16.8	1	.....	.....	-17.6	1	.....	.....
4352-908	.....	.....	.....	.....	20.1	1	.....	.....	-19.9	1	.....	.....	.....	.....
4352-908	.....	.....	.....	.....	-23.6	1	.....	.....	.....	.....	.....	.....	.....	.....
Weighted mean	-22.94		-19.67		-19.04		-17.48		-15.17		-15.24		.....	.....
V_a	+ 8.73		+ 8.31		+ 7.52		+ 6.73		+ 5.67		+ 3.49		.....	.....
V_d	- .16		- .19		+ .23		- .13		+ .07		+ .06		.....	.....
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		.....	.....
Radial Velocity	- 14.6		- 11.8		- 11.6		- 10.9		- 9.7		- 12.0			

Dominion Observatory
Ottawa
April, 1919.



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